Strengths & Weaknesses

FERC Observations

September 29, 2004

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Examples of Capability Diversity

- Tools
- Operational practices
- Backup center
- Training
- Wide area view
- Security

No definitive standards

Tools

- Real time state estimation
- On-line contingency analysis
- Prioritized alarms
- Suggested remedial actions
- EMS monitoring
- ❖ See Frank Macedo's tools catalogue presented at the 7/14 software conference and the check-off list that is now included with the audit materials

Example Page From The Tools Catalog

Reliability Software
Minimum Requirements & Best Practices
Frank Macedo - FERC
Technical Conference July 14, 2004

Caveat: The minimum requirements and performance indicies quoted are considered to be commercially achievable and are not intended to be regulatory requirements. Their purpose is to initiate industry discussion on what these minimum reliability capabilities ought to be.

	Reliability Applications & Tools	Description	Classification	
	Network Analysis			
1	Network Topology Processor	Computes the correct status of the network connectivity as a front-end to the State Estimator to reduce mismatches and improve robustness.	Minimum Requirement	
2	State Estimator (SE)	Provides a reliable real time ac power flow model and system snapshot computed at least every 2 minutes with mismatches less than 10 MVA. Used for RTCA and other Reliability based and Market based applications.	Minimum Requirement	
3	Real Time Contingency Analysis (RTCA)	Contingency analysis computed at least every 5 minutes for all internal facilities typically 100 kV and above and for all facilities external to the foot-print that have the potential for adverse impact within the internal system	Minimum Requirement	
4	Critical Facility Loading Assessment	Assesses the post contingency loading of critical facilities using telemetered data and Line Outage Distribution Factors (LODF) at least every 5 seconds with LODFs updated on status change. This is a fall back should the state estimator fail to solve.		Best Practice

Operating Practices

- Procedural rigor
  - Prior study of contingency response and reserve restoration recovery time
  - Immediate study of changed connectivity
  - Procedures that specify what to do, when, and how quickly
- Demonstrated ability and willingness to shed firm load
- Ability and willingness to move generation (real and reactive) to test response capability
- Planning / outage scheduling / probabilistic scenarios
  - "We will deal with it when and if it appears in real-time"

Backup Control Center

- Functions
  - All reliability functions, computers, and tools including full market operations
  - Minimal tools &/or requires the control center's computers
- Operability
  - Continuously manned
  - Tested/exercised regularly
  - Simply a plan
- Communications
  - Full communications
  - Redundant communications
  - Knowledge of communications paths
- Proximity
  - Far enough away to avoid a common disaster
  - Close enough to get to promptly

Training & Simulators

- Training requirements are minimal
  - Vacation, sick leave, and coverage often come out of stated available training hours
- Staffing levels impact training opportunities
  - 5, 6, 7 shift rotations
- Training is often unstructured
- Training simulators

  - Very valuable, provide high stress learning opportunities
  - Labor intensive for operators and trainers

Wide Area Visualization

- Obtaining *data* from a wide area is improving, but there is still diversity
- Data quality problems abound
- No agreement on how to visualize the wide area
  - Distinct from well developed visualization of individual lines, busses, and specific problems
  - Provides protection from rare, massive events
- *Some* CA/RCs are trying various approaches
  - Others are not
  - A goal may be to encourage the effort rather than a specific solution at this time

Security

- Security measures vary
  - Armed federal officers
  - Escorted access
  - Required ID

Conclusions

- There is diversity in CA/RC capabilities
  - Tools
  - Procedures
  - Backup center
  - Training
  - Wide area view
  - Security
- There has been significant improvement
- There is a great need for further improvement
- Substantial minimal standards are required